

An empirical investigation of students' behavioural intentions to use the online learning course websites

Su-Chao Chang and Feng-Cheng Tung

Su-Chao Chang is a professor of Business Administration at National Cheng Kung University, Taiwan. Her research interests include management, strategic management, Organization Theory. Feng-Cheng Tung is a doctoral student of Business Administration at National Cheng Kung University and lecturer at Diwan College of Management, Taiwan. He has participated with Professor Chang's research team for two years. His research interests include e-learning, education, management information systems, strategic management. Address for correspondence: Feng-Cheng Tung, No.18, Lane 44, Sec. 4, Jinhua Rd., West Central District, Tainan City 70059, Taiwan (R.O.C.), Email: tungfc66@yahoo.com.tw

Abstract

With the development of the Internet in the era of knowledge-driven economy, e-learning is experiencing rapid growth. The online learning course websites are drawing more attention as well. This research combines the innovation diffusion theory and the technology acceptance model, and adds two research variables, perceived system quality and computer self-efficacy to propose a new hybrid technology acceptance model to study students' behavioural intentions to use the online learning course websites. This research finds that compatibility, perceived usefulness, perceived ease of use, perceived system quality and computer self-efficacy were critical factors for students' behavioural intentions to use the online learning course websites. By explaining students' behavioural intentions from a user's perspective, the findings of this research help to develop more user-friendly websites and also provide insight into the best way to promote new e-learning tools for students.

Introduction

In addition to internal and external environmental changes such as prevailing Internet deployment and fast changing and innovative Internet technologies, the development of network communication science and technology has accorded a special benefit to teaching. New technological media provide highly dynamic communications. Multimedia and computer networks make learning tools easier and more convenient to use. Information and databases have become more powerful; offering several channels, routes and resources. The creation of this new learning environment has led to multidimensional learning. Electronic learning (e-learning) has seen an exponential growth. Govindasamy (2002) believes e-learning has offered another avenue to

enhance teaching and learning. Generally speaking, it includes all types of teaching methods via electronic media, such as: Internet, intranet, extranet, satellite broadcasts, audio/video, interactive TV and CD-ROMs. The true value of e-learning lies in its availability, offering training at any time and anywhere to anyone, as well as offering this training to the right person with competent technical ability or knowledge at the right time. Thornton, Jefferies, Jones, Alltree and Leinonen (2004) suggest that e-learning is a tool which can improve teaching and learning skills; its effectiveness lies in whether the tool is used properly.

Online learning course websites are becoming more popular as people come to appreciate the advantages of learning online. Seal and Przasnyski (2001) attempted to use the Web beyond a simple means for distribution of class materials. Six feedback forms were administered during the course of a semester. Students in the course indicated that the course websites helped them to understand the course materials better. Lin and Hsieh (2001) reviewed the research evidence on learner control in a web-based teaching environment and the conditions under which it most effectively facilitated learning. Gal-Ezer and Lupo (2002) concluded that the more advanced the students were in their studies, the more they tend to use the Web in its various applications.

This research combines the innovation diffusion theory (IDT) and technology acceptance model (TAM), and adds two research variables, perceived system quality and computer self-efficacy, to propose a new hybrid technology acceptance model to study students' behavioural intentions to use the online learning course websites. The innovation diffusion theory has been widely used for relevant information technology (IT) research (Karahanna, Straub & Chervany, 1999). According to the TAM, usage behaviour is determined by the intention to use a particular system, which in turn is determined by the perceived usefulness and perceived ease of use of the system. However, the existing parameters of the TAM are not enough to fully reflect to the online learning course website users' motives. The research proposes two new constructs, perceived system quality and computer self efficacy, to enhance the understanding of the online learning course website users.

Finally, this research combines IDT and TAM, and also uses perceived system quality and computer self-efficacy as two dimensions; creating a new hybrid technology acceptance model to study students' behaviour intentions to use the online learning course websites. By explaining students' behavioural intentions from a user's perspective, the findings of this research help to develop more user-friendly websites and also provide insight into the best way to promote new e-learning tools for students.

Theoretical background

Computer self-efficacy

Computer self-efficacy is defined as 'an individual's perceptions of his or her ability to use computers in the accomplishment of a task rather than reflecting simple component skills'. Computer self-efficacy is a belief of one's capability to use the computer (Compeau & Higgins, 1995, p. 192). Computer self-efficacy refers to a judgement of

one's capability to use a computer. It is not concerned with what one has done in the past, but rather with judgments of what could be done in the future. Moreover, it does not refer to simple component subskills, like formatting diskettes or entering formulas into a spreadsheet. Rather, it incorporates judgments of the ability to apply those skills to broader tasks (Compeau & Higgins, 1995).

Innovation diffusion theory

An innovation is 'an idea, practice, or object that is perceived as new by an individual or another unit of adoption' (Rogers, 1995, p. 11). An innovation generates uncertainty, and uncertainty motivates an individual or another unit of adoption to seek more information about alternatives. Diffusion on the other hand is 'the process by which an innovation is communicated through certain channels over time among the members of a social system' (Rogers, 1995, p. 5).

IDT includes five significant innovation characteristics: relative advantage, compatibility, complexity, trial ability and observability. It has been widely applied in disciplines such as education, sociology, communication, marketing, etc (Rogers, 1995). Relative advantage means that innovations can bring greater advantage than traditional methods. Compatibility is the degree to which the innovation is perceived to be consistent with the potential users' existing values, previous experiences, and needs. Complexity represents the level of difficulty in understanding innovations and their ease of use. Trial ability refers to the degree to which innovations can be tested. Observability refers to the degree to which the results of innovations can be observed by people. These characteristics are used to explain the user adoption and decision-making process. However, previous studies found that only relative advantage, compatibility and complexity are consistently related to the adoption of innovation (Agarwal & Prasad, 1998).

Previous studies have found that the relative advantage construct in IDT is similar to the perceived usefulness in TAM, and the complexity construct in IDT is similar to the perceived ease of use (Moore & Benbasat, 1991). But in TAM research, compatibility has not been studied. In order to increase the credibility and effectiveness of the study, in this research, we improve TAM and include the compatibility study as an additional research construct to carry on this research. Because previous research has shown no apparent correlations between trial ability, observability and IT adoption, we exclude these research constructs (Agarwal & Prasad, 1998).

Wu and Wang (2005) integrated IDT into TAM to investigate what determines user mobile commerce (MC) acceptance. They found that compatibility has a direct effect on perceived usefulness and behavioural intention to use. So in this research, we combine IDT and TAM, adding compatibility as an additional research construct.

Technology acceptance model

TAM (Davis, Bagozzi & Warshaw, 1989) originally suggested that two beliefs—perceived usefulness and perceived ease of use—are instrumental in explaining the variance in

users' intentions. Perceived usefulness is the degree to which a person believes that using a particular system enhances his or her job performance. Perceived ease of use is the degree to which a person believes that using a particular system will be free of effort. These determinants are also easy to understand for system developers and can be specifically considered during system requirement analysis and other system development stages. These factors are common in technology-usage settings and can be applied widely to solve the acceptance problem (Taylor & Todd, 1995). Researchers have investigated TAM, and agreed that it is valid in predicting the individual acceptance of various systems (Chin & Todd, 1995; Doll, Hendrickson & Deng, 1998; Segars & Grover, 1993).

The objective of TAM is to provide an explanation of the determinants of computer acceptance that in general, is capable of explaining user behaviour across a broad range of end-user computing technologies and user populations (Davis *et al*, 1989).

Research model and hypotheses

The research model of this research is as shown in Figure 1. We have modified it according to prior research on IDT (Moore & Benbasat, 1991) and TAM (Gefen, 2004; Taylor & Todd, 1995; Venkatesh & Davis, 2000). We have integrated IDT, TAM, per-

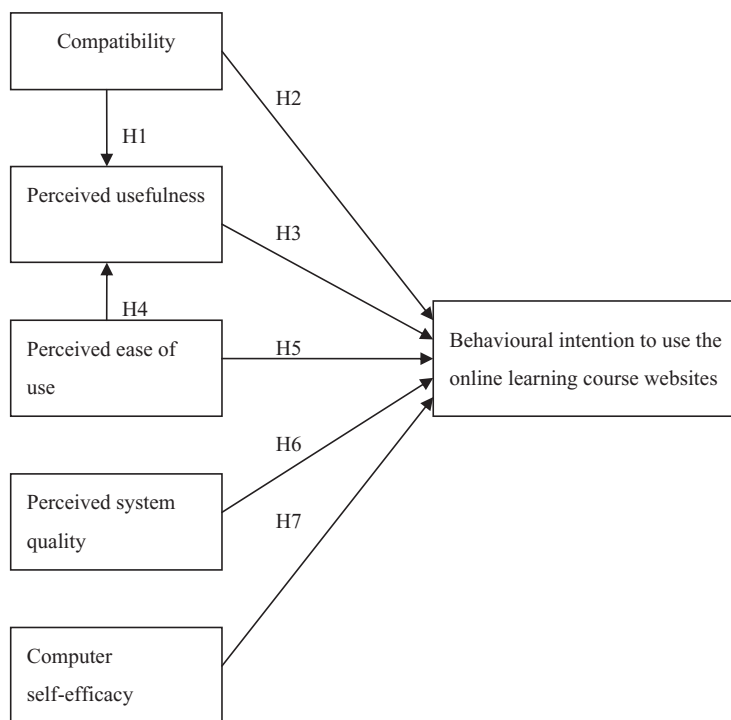


Figure 1: Research model (Model 2)
H, hypothesis

ceived system quality, computer self-efficacy and proposed a new hybrid technology acceptance model to study students' behavioural intentions to use the online learning course websites.

Compatibility

Compatibility is the degree to which the innovation is perceived to be consistent with the potential users' existing values, previous experiences and needs. Previous studies have found that the relative advantage construct in IDT is similar to the perceived usefulness in TAM, and the complexity construct in IDT is similar to the perceived ease of use (Moore & Benbasat, 1991). But in TAM research, compatibility has not been studied. In order to increase the credibility and effectiveness of the study, in this research, we improve TAM and include the compatibility study as an additional research construct to carry on this research. Wu and Wang (2005) found compatibility has a direct effect on perceived usefulness and behavioural intention to use after combining IDT and TAM. Thus we hypothesised:

- Hypothesis 1: Compatibility will have a direct effect on perceived usefulness.
- Hypothesis 2: Compatibility will have a direct effect on behavioural intention to use the online learning course websites.

Perceived usefulness

Perceived usefulness is the degree to which a person believes that using a particular system will enhance his or her job performance. Information system researchers have investigated TAM, and agreed that it is valid in predicting the individual acceptance of various systems (Chin & Todd, 1995; Doll *et al.*, 1998; Segars & Grover, 1993; Venkatesh & Davis, 2000). Information system researchers have discovered that perceived usefulness has a positive effect on the behavioural intention to use systems (Chin & Todd, 1995; Doll *et al.*, 1998). Therefore, we hypothesised:

- Hypothesis 3: Perceived usefulness will have a positive effect on the behavioural intention to use the online learning course websites.

Perceived ease of use

Perceived ease of use is the degree to which a person believes that using a particular system will be free of effort. Information system researchers have found that perceived ease of use has a positive effect on the behavioural intention and perceived usefulness to use systems (Chin & Todd, 1995; Doll *et al.*, 1998). Thus, we hypothesised:

- Hypothesis 4: Perceived ease of use will have a positive effect on the perceived usefulness of the online learning course websites.
- Hypothesis 5: Perceived ease of use will have a positive effect on the behavioural intention to use the online learning course websites.

Perceived system quality

System quality is concerned with whether or not there are 'bugs' in the system, the consistency of the user interface, ease of use, response rates in interactive systems,

quality documentation, and sometimes, quality and maintainability of the program code (Seddon, 1997). Rai, Lang and Welker (2002) empirically assessed the Seddon Information System (IS) success model (Seddon, 1997) in a quasi-voluntary IS usage context and found a significant path from system quality to user satisfaction. Chiu, Hsu, Sun, Lin and Sun (2005) found perceived system quality has a positive effect on the behavioural intention to use the e-learning service. Thus, we hypothesised:

- Hypothesis 6: Perceived system quality will have a positive effect on the behavioural intention to use the online learning course websites.

Computer self-efficacy

Computer self-efficacy is defined as 'an individual's perceptions of his or her ability to use computers in the accomplishment of a task rather than reflecting simple component skills' (Compeau & Higgins, 1995, p. 192). The more experience one acquires online, the more important are concerns of control over personal information, implying that computer self-efficacy will have a positive effect on the behavioural intention to use systems (Vijayasathya, 2004). Thus, we hypothesised:

- Hypothesis 7: Computer self-efficacy will have a positive effect on the behavioural intention to use the online learning course websites.

Research methodology

Sampling method

The sample for the study was taken from 736 undergraduate students who were using the online learning course websites in Taiwan. A total of 247 surveys were returned in April 2006. The rate of response of the questionnaire was 33% of 247 basic questionnaires returned, we had to leave out 35 in which some questions had not been answered, leaving the number of valid questionnaires at 212.

Instrument

To ensure content validity of the scales used, the items selected must represent the concept around which generalisations are to be made. Items selected for the constructs were adapted from prior studies in order to ensure content validity. All the 21 items used a 7-point Likert scale with 1 representing *exceptionally disagree* and 7 representing *exceptionally agree*.

The questionnaire includes six parts. The first part is nominal scales and the rest are 7-point Likert scales. Part 1 of the questionnaire is to collect the interviewees' basic materials, including interviewees' gender, age and the number of years they have used the Internet. Part 2 of the questionnaire is based on the construct of compatibility in IDT and is adapted from the measurement defined by Wu and Wang (2005), containing three items. Part 3 of the questionnaire is based on the constructs of Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) in the TAM model and is adapted from the measurement defined by Venkatesh and Davis (1996, 2000), containing four items for both constructs. Part 4 of the questionnaire is based on the construct of perceived system quality and is adapted from the study of Chiu *et al* (2005), containing six items.

Table 1: Sample demographics

Gender	Age	%	Experience in using Internet	
				%
Male = 40%	<18	16	<3 years	5
Female = 60%	18–20	60	3 to 5 years	20
	>20	24	>5 years	75

Part 5 of the questionnaire is based on the construct of computer self-efficacy and is adapted from the study of Vijayasathya (2004), containing two items. Part 6 of the questionnaire is based on the construct of behavioural intention to use and is adapted from the study of Venkatesh and Davis (1996, 2000), containing two items.

Sample demographics

Of the students who filled out answers in this questionnaire, 40% were men, and 60% were women. Most of them were 18 to 20 years old, making up 60% of the samples. The majority of those replying to the questionnaire comprised people with longer than 5-years of Internet experience, and they made up 75% of the sample. Sample demographics are depicted thus in Table 1.

Data analysis and results

Analysis of the measurement model

This research has adopted structural equation modelling (SEM) for its data analysis to study the causalities among all parameters constructed in each model. The estimation of the parameters uses the maximum likelihood estimation (MLE), and the sample size cannot be too small when utilising this. It is generally acknowledged that the sample size should lie at least somewhere between 100 to 400 in order to be suitable for MLE (Ding, Velicer & Harlow, 1995). Our sample size was 212, meeting the requirement. The statistical analysis software used for the research was LISREL 8.3 and SPSS 13.0. When carrying out analysis with SEM, measurement model analysis and structural model analysis are two necessary stages of the research model.

The data obtained were tested for reliability and validity using confirmatory factor analysis. The model included 21 items describing six latent constructs: compatibility, perceived usefulness, perceived ease of use, perceived system quality, computer self-efficacy, and behavioural intention to use. In order to measure the reliability, convergent validity and discriminant validity of the theoretical constructs of this research, we selected three most frequently used indexes according to the suggestion of Bagozzi and Yi (1988) in this research: individual item reliability, composite reliability (CR) and average variance extracted (AVE) to rate the evaluation model.

Individual item reliability assesses the factor loading of a potential variable stemming from its corresponding measurement item. Fornell and Larcker (1981) suggest that the CR value should be greater than 0.6. Fornell and Larcker (1981) propose that the AVE

Table 2: Construct reliability, convergent validity and discriminate validity

Construct	CR	Factor correlations						
		AVE	C	PU	PEOU	PSQ	CSE	BI
C	0.91	0.77	—					
PU	0.89	0.67	0.33	—				
PEOU	0.86	0.61	0.20	0.35	—			
PSQ	0.95	0.76	0.16	0.15	0.37	—		
CSE	0.88	0.79	0.34	0.20	0.36	0.30	—	
BI	0.87	0.77	0.46	0.44	0.56	0.41	0.64	—

C, compatibility; PU, perceived usefulness; PEOU, perceived ease of use; PSQ, perceived system quality; CSE, computer self-efficacy; BI, behavioural intention.

value should be greater than 0.5. As shown in Table 2, the average value of variables used for the research model accords with suggested values of the three indexes, which means these research variables have good convergent validity, and their total AVE is larger than their correlation value, these research variables have discriminate validity. Table 3 displays the completely standardised factor loadings and individual item reliability of the items on the constructs that they were designed to measure.

Analysis of the structural model

Five common model-fit measures were used to assess the model's overall goodness-of-fit: the ratio of χ^2 to degrees-of-freedom (χ^2/df); goodness-of-fit index (GFI); normalised fit index (NFI); comparative fit index (CFI); root mean square error of approximation (RMSEA).

Model 1 is for a one-factor model. The ratio of χ^2 to degrees-of-freedom (χ^2/df) for the model 1 was calculated to be 13.68. The GFI was 0.53, which is smaller than the 0.80 benchmark suggested by Doll, Xia and Torkzadeh (1994). The NFI here was 0.72, which is smaller than the 0.90 benchmark suggested by Bentler (1989). The CFI here was 0.74, which is smaller than the 0.90 benchmark suggested by Bentler (1989). The RMSEA was 0.25, which was greater than the recommended range of acceptability (<0.05–0.08) suggested by MacCallum, Browne and Sugawara (1996).

Model 2 represents the research method shown in Figure 1. The ratio of χ^2 to degrees-of-freedom (χ^2/df) for Model 2 was calculated to be 1.78. The GFI was 0.88, which is greater than the 0.80 benchmark suggested by Doll *et al* (1994). The NFI here was 0.95, which is greater than the 0.90 benchmark suggested by Bentler (1989). The CFI here was 0.98, which is greater than the 0.90 benchmark suggested by Bentler (1989). The RMSEA was 0.061, which was slightly greater than the recommended range of acceptability (<0.05–0.08) suggested by MacCallum *et al* (1996). Based on the five indexes previously mentioned, this study concluded that the Model 2 is better the Model 1 in all aspects. Therefore, this study takes Model 2 as the research method.

Table 3: Standardised factor loadings and individual item reliability

Item	Measure	Factor loading	$R^2 > 0.5$
C1	Using the online learning course websites is compatible with most of my learning.	0.89	0.79
C2	Using the online learning course websites is appropriate for my learning style.	0.89	0.79
C3	Using the online learning course websites is appropriate for my learning.	0.85	0.72
PU1	The online learning course websites can improve my learning efficiency.	0.87	0.76
PU2	The online learning course websites can enhance my learning performance.	0.79	0.62
PU3	The online learning course websites increase my learning output.	0.83	0.69
PU4	I find the course websites are useful for my learning.	0.77	0.59
PEOU1	It is easy to operate the online learning course websites and I get it to do what I want it to do.	0.74	0.55
PEOU2	I find that the online learning course websites are very easy to use.	0.80	0.64
PEOU3	I find that the human interface of the online learning course websites is clear and easy to understand.	0.83	0.69
PEOU4	I find that interacting with the online learning course websites doesn't demand much care or attention.	0.74	0.55
PSQ1	The layout and user interface design of the online learning course websites is friendly.	0.92	0.85
PSQ2	It is easy to navigate the online learning course websites.	0.77	0.59
PSQ3	The online learning course websites provide the service I need.	0.75	0.56
PSQ4	I feel comfortable in using the functions and services provided by the online learning course websites.	0.94	0.88
PSQ5	The online learning course websites provide complete learning information.	0.90	0.81
PSQ6	The online learning course websites provide information that is easy to comprehend.	0.92	0.85
CSE1	I expect to become proficient in using the online learning course websites.	0.94	0.88
CSE2	I would feel confident that I can use the online learning course websites.	0.84	0.71
BI1	If I get to use the online learning course websites, I intend to use the course websites.	0.88	0.77
BI2	If I get to use the online learning course websites, I expect I that will use the course websites.	0.86	0.74

C, compatibility; PU, perceived usefulness; PEOU, perceived ease of use; PSQ, perceived system quality; CSE, computer self-efficacy; BI, behavioural intention (BI).

Table 4: Goodness-of-fit measures

Fit Indices	χ^2	χ^2/df	GFI	NFI	CFI	RMSEA
Recommended value	—	≤ 3.0	≥ 0.8	≥ 0.9	≥ 0.9	$\leq 0.05\sim 0.08$
Model 1 (one-factor model)	1614.64	13.68	0.53	0.72	0.74	0.25
Model 2	312.49	1.78	0.88	0.95	0.98	0.061

χ^2 = Chi-square.

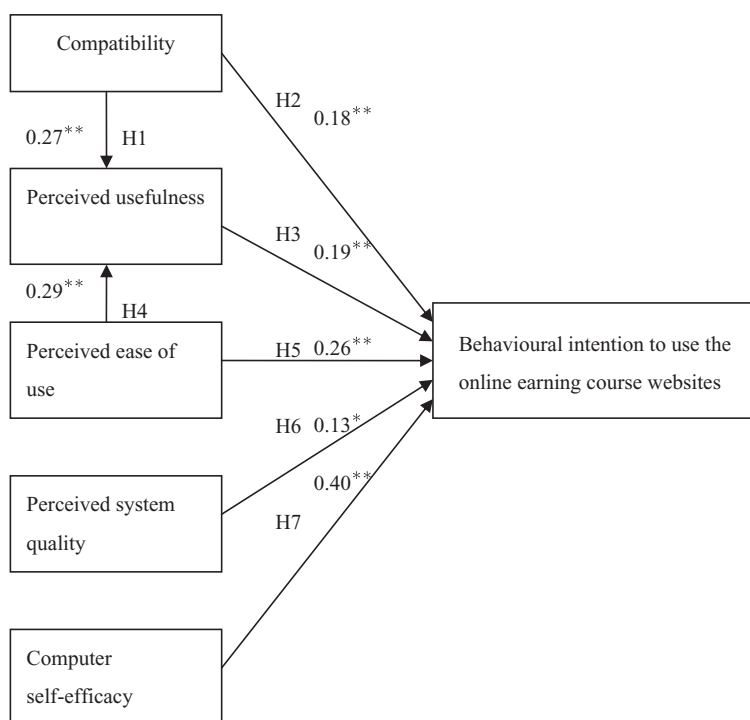


Figure 2: Results of the testing of the hypotheses (H)

* $p < 0.05$; ** $p < 0.01$

The various goodness-of-fit statistics are summarised in Table 4.

Next, we proceed to examine the path coefficients of the structural model. The significant structural relationship among the research variables and the standardised path coefficients are presented in Figure 2. The data shows that compatibility had a positive effect on both perceived usefulness ($\gamma = 0.27$, $p < 0.01$) and the behavioural intention to use the online learning course websites ($\gamma = 0.18$, $p < 0.01$). Therefore, Hypotheses 1 and 2 are supported. Perceived usefulness had a positive effect on the behavioural

intention to use the online learning course websites ($\beta = 0.19, p < 0.01$). This means that Hypothesis 3 is supported. Perceived ease of use had a positive effect on perceived usefulness ($\gamma = 0.29, p < 0.01$), the behavioural intention to use the online learning course websites ($\gamma = 0.26, p < 0.01$). Thus, Hypotheses 4 and 5 are supported. Perceived system quality had a positive effect on the behavioural intention to use the online learning course websites ($\gamma = 0.13, p < 0.05$). This means that Hypothesis 5 is supported. Finally, the data implies that the computer self-efficacy had a positive effect on the behavioural intention to use the online learning course websites ($\gamma = 0.40, p < 0.01$). This means that Hypothesis 7 is supported.

Discussion and conclusions

The research's purpose is to use a new hybrid technology acceptance model to study students' behavioural intentions to use the online learning course websites. In this research, we found that compatibility has a great positive and direct effect on perceived usefulness and the behavioural intention to use the online learning course websites. In other words, the higher the compatibility of the online learning course websites users, the higher the perceived usefulness. Higher Compatibility also increases the behavioural intention to use the online learning course websites. Hypotheses 1 and 2 are supported. These findings are consistent with Wu and Wang's (2005) research results.

We also found that perceived usefulness and perceived ease of use have a great positive and direct effect on the behavioural intention to use the online learning course websites. That is to say, the online learning course websites users think that higher perceived usefulness results in a higher behavioural intention to use the online learning course websites. Perceived ease of use increases the behavioural intention to use the online learning course websites. The research also shows that perceived ease of use has a positive direct effect on perceived usefulness. These findings match what Venkatesh and Davis (1996, 2000) found in their research.

The research also shows, perceived system quality has a positive direct effect on behavioural intention to use the online learning course websites. These findings match what Chiu *et al* (2005) found in their research. The research shows that the computer self-efficacy had a positive effect on behavioural intention to use the online learning course websites. This finding coincides with Vijayasarathy's (2004) research conclusions.

This study combines IDT, TAM, perceived system quality and computer self-efficacy and proposes a hybrid technology acceptance model to study students' acceptance of the online learning course websites in Taiwan. Using the new hybrid technology acceptance model as a theoretical framework, this study predicts how students will respond to the online learning course websites, and increases students acceptance by improving the techniques and processes by which they are implemented. Major contributions are:

1. This research found that compatibility, perceived usefulness, perceived ease of use, perceived system quality and computer self-efficacy were critical factors for students' behavioural intentions to use the online learning course websites.

2. This research found that perceived usefulness and perceived ease of use have a great positive and direct effect on the behavioural intention to use the online learning course websites. Perceived system quality has a positive direct effect on behavioural intention to use the online learning course websites.
3. The findings of this study have significant implications on the appropriateness of relying on the online learning course websites. Instructors and higher education institutions should focus on the online learning course websites' usefulness and ease of use because they form the higher predictive effect on online learning course website acceptance and usage.
4. This research found that computer self-efficacy was the most important research variable that affects the behavioural intention to use the online learning course websites. Computer self-efficacy had a positive effect on behavioural intention to use the online learning course websites.
5. This research combined IDT and TAM, and proposed a new hybrid technology acceptance model to study students' acceptance of the online learning course websites.
6. This research added two new research constructs, perceived system quality and computer self-efficacy, so that the research model will be more complete and thus improves the fitness of the whole theory model.

This research issues three suggestions regarding the future research direction. First, because of the different degree of the education and technology development of each country, whether the acceptance degree of the online learning course websites for the students in the countries whose education and technology are more progressive and in countries whose education and technology are backward would receive the same factor influence or not is worthwhile for further comparison and research. Second, the incurred expense of using the online learning course websites might increase the financial loading for the students, and further influence the desire of using online learning course websites. Therefore, considering the influence of the financial cost towards the acceptance degree of the online learning course websites is also the future feasible research direction. Finally, the future research can attempt to connect the behavioural intentions and the satisfaction of the students who use the online learning course websites, and further explore the relations between the behavioural intentions and the satisfaction.

References

- Agarwal, R. & Prasad, J. (1998). A conceptual and operational definition of personal Innovativeness in the domain of information technology. *Information Systems Research*, 9, 2, 204–215.
- Bagozzi, R. P. & Yi, Y. (1988). On the evaluation structural equation models. *Academic of Marketing Science*, 16, 74–94.
- Bentler, P. M. (1989). *EQS structural equations program manual*. Los Angeles: BMDP.
- Chin, W. C. & Todd, P. A. (1995). On the use, usefulness and ease of use of structural equation modeling in MIS research: a note of caution. *MIS Quarterly*, 19, 2, 237–246.
- Chiu, C. M., Hsu, M. H., Sun, S. Y., Lin, T. C. & Sun, P. C. (2005). Usability, quality, value and E-learning continuance decisions. *Computers & Education*, 45, 4, 399–416.
- Compeau, D. R. & Higgins, C. A. (1995). Computer self-efficacy: development of a measure and initial test. *MIS Quarterly*, 19, 2, 189–211.

- Davis, F. D., Bagozzi, R. P. & Warshaw, P. R. (1989). User acceptance of computer technology: a comparison of two theoretical models. *Management Science*, 35, 982–1002.
- Ding, L., Velicer, W. & Harlow, L. (1995). Effects of estimation methods, number of indicators per factor and improper solutions on structural equation modeling fit indices. *In Structural Equation Modeling*, 2, 119–143.
- Doll, W. J., Hendrickson, A. & Deng, X. (1998). Using Davis's perceived usefulness and ease-of-use instruments for decision making: a confirmatory and multi-group invariance analysis. *Decision Science*, 29, 4, 839–869.
- Doll, W. J., Xia, W. & Torkzadeh, G. A. (1994, December). A confirmatory factor analysis of the End-User Computing Satisfaction Instrument. *MIS Quarterly*, 18, 453–461.
- Fornell, C. & Larcker, D. F. (1981). Evaluating structural equation models with unobservables and measurement error. *Journal of Marketing Research*, 18, 39–50.
- Gal-Ezer, J. & Lupo, D. (2002). Integrating Internet tools into traditional CS distance education: students' attitudes. *Computers & Education*, 38, 4, 319–329.
- Gefen, D. (2004). What makes an ERP implementation relationship worthwhile: linking trust mechanisms and ERP usefulness. *Journal of Management Information Systems*, 21, 1, 263–288.
- Govindasamy, T. (2002). Successful implementation of E-learning pedagogical considerations. *Internet and Higher Education*, 4, 287–299.
- Karahanna, E., Straub, D. W. & Chervany, N. L. (1999). Information technology adoption across time: A cross-sectional comparison of pre-adoption and post-adoption beliefs. *MIS Quarterly*, 23, 2, 183–213.
- Lin, B. & Hsieh, C. (2001). Web-based teaching and learner control: a research review. *Computers & Education*, 37, 3–4, 377–386.
- MacCallum, R. C., Browne, M. W. & Sugawara, H. W. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, 1, 2, 130–149.
- Moore, G. C. & Benbasat, I. (1991). Development of instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*, 2, 3, 192–222.
- Rai, A., Lang, S. S. & Welker, R. B. (2002). Assessing the validity of IS success models: An empirical test and theoretical analysis. *Information Systems Research*, 13, 1, 50–69.
- Rogers, E. M. (1995). *The diffusion of innovation*, fourth. New York: Free Press.
- Seal, K. C. & Przasnyski, Z. H. (2001). Using the World Wide Web for teaching improvement. *Computers & Education*, 36, 1, 33–40.
- Seddon, P. B. (1997). A respecification and extension of the DeLone and McLean model of IS success. *Information Systems Research*, 8, 3, 240–253.
- Segars, A. H. & Grover, V. (1993). Re-examining perceived ease of use and usefulness: a confirmatory factor analysis. *MIS Quarterly*, 17, 4, 517–525.
- Taylor, S. & Todd, P. A. (1995). Understanding information technology usage: a test of competing models. *Information System Research*, 6, 2, 144–176.
- Thornton, M., Jefferies, A., Jones, I., Alltree, J. and Leinonen E. (2004). *Changing pedagogy: does the introduction of networked learning have an impact on teaching?* Networked Learning Conference 2004, Symposium 8, April 5–7, Lancaster University, UK.
- Venkatesh, V. & Davis, F. D. (1996). A model of the antecedents of perceived ease of use: development and test. *Decision Sciences*, 27, 3, 451–481.
- Venkatesh, V. & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: four longitudinal field studies. *Management Science*, 46, 2, 186–204.
- Vijayarathay, L. R. (2004). Predicting consumer intentions to use on-line shopping: the case for an augmented technology acceptance model. *Information & Management*, 41, 6, 747–762.
- Wu, J. H. & Wang, S. C. (2005). What Drives Mobile Commerce?: An Empirical Evaluation of the Revised Technology Acceptance Model. *Information & Management*, 42, 5, 719–729.

Copyright of British Journal of Educational Technology is the property of Blackwell Publishing Limited and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.